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Meen
Prior
Lam

Proceedings of the 2017 IEEE International Conference on Applied System Innovation (IEEE-ICASI 2017), Sapporo, Japan, 13-17 May 2017.

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Applied System Innovation for Modern Technology

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Initialization Requirement in Developing of Mobile Learning 'Molearn' for Biology Students Using Inquiry-based learning

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Abstract

Inquiry-based learning is kind of learning activities that involves students' entire capabilities in exploring and investigating particular objects or phenomenon using critical thinking skills. Recently, information technology tangibly contributes in any education aspects, including the existence of e-learning, a widely spreading learning model in the 21st century education. This study aims at initializing needs of developing mobile learning 'Molearn' based on inquiry-based method. By cooperating with Biology teacher community in senior high school, 'Molearn' provides IT-based medium in Biology learning process.

Key words: inquiry-based learning; mobile learning; biology subject

Introduction

As the development of learning paradigm, the phenomenon of teacher-centered instruction has been shifted into student-centered instruction in which teacher and students are actively involved in learning activities. In other words, teacher is not defined as the one who masters the all-around knowledge. Moreover, students are active through learning activities. The learning method used by recent phenomenon tends to create students' knowledge within themselves and not merely from outside factors. Beside the shifted learning method, there is also a change of used learning medium. The change happens due to the recently different needs from the fact that of previous decades. The needs will always be connected to one another through recently innovative ways. To cope with that, web-based learning or mobile learning comes up newly as an idea in corresponding innovative learning strategy where students can broaden their unlimited knowledge.

There are four main elements in teaching and learning process [1] namely student-centered teaching and learning process, collaborative education, context-based learning, and nature-based school. Based on the four elements, it is important to have an innovative learning medium which accommodates learner needs such as something dealing with their current situation. In connection with the current learning medium, 'Molearn' is a web-based and mobile-based learning that becomes appropriate learning medium to accommodate inquiry-based method. Inquiry-based method can be defined as a method which compels students to broadly explore particular materials and to solve problems precisely. 'Molearn' responses the above phenomenon where students can also do autonomous learning such as searching and exploring materials easily.

Content Design

A. Inquiry-based Learning

There are five stages of teaching and learning process in inquiry method namely dealing with problems (explaining research procedures, portraying contrastive situation), solving problems (investigating the notion of the objects and condition faced, investigating causes of problems), inspecting data and experiment (isolate relevant variable, drawing hypothesis), organizing, formulating, and explaining, and analyzing research processes to get to more effective procedure [2]

Based on the characteristics of inquiry method, this study aims to make Biology course at Senior High School become the pilot project in Science Major. Inquiry method is a proven method to enhance the quality of teaching and learning process, especially on developing critical thinking or improving intellectuality as mental process. Some previous studies claim that inquiry method shows positive effects either in exact sciences or social sciences from diverse education level [3][4][5][6].

B. Mobile Learning

Viewed by technical perspective, Information- and Technology-based (IT-based) learning is indeed effective. Technology contributes a lot in any aspects of education field. One of the contributions is information technology that contributes a lot to unlimited borders of learning. E-learning or online learning has been majorly used in high school or in tertiary level [7][8], regardless the exist weaknesses, however, it still has important role in this recent education. The condition is influenced by diverse factors such as over information, the 21st century skills, easy access to technology makes the implementation of information technology in classroom stronger and more exposed [9]. Realizing that each person is unique, different in either attitude, mood, motoric skill, intellectuality, learning acceleration, and soon, so that as the first thing to consider in developing mobile learning 'Molearn' is to identify important elements in connection with users' common skill and task which will be dealt with by utilizing 'Molearn'. Mobile learning can be transform of educational technology globally. Students at all levels in education can access to educational resources, anytime anywhere. Mobile devices such as tablets and smartphones has an important role in learning process. Mobile learning supporting them to interact and collaborate with others. The advantages of the Mobile device are flexibility, portability and affordability, support student involvement with learning objects, students' motivate and increase their learning interest.

C. Identification of Utilizations and Needs

In developing 'Molearn', the most important and significant step to do is to identify who will be using such technology [10], in this case is teacher and students. There are four aspects in identification stage namely knowledge, experience, need for task, and psychological characteristic. Figure 1 shows the concept of the four aspects in identification stage.

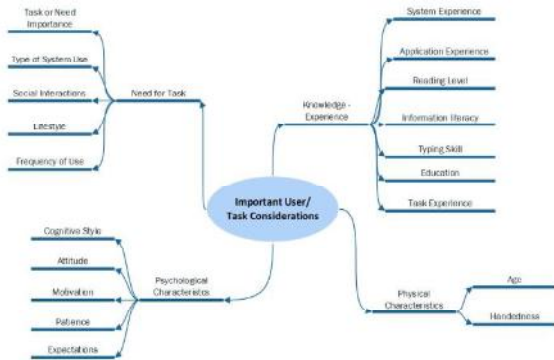


Fig. 1 The four aspects in identification stage.

Knowledge and experience include the identification of users in connection with their experience in using such e-learning, skill in utilizing e-learning, coziness of reading materials, skill in doing information literacy, typing skill, education level and experience relating to ever-done assignments by utilizing e-learning. The main users who get identified are teacher and students who utilize 'Molearn' directly and continuously. The identification is conducted in the utilization of e-learning because 'Molearn' is one development in e-learning that exists and is widely.

The next aspect is in connection with the needs of assignments. The development of mobile learning application 'Molearn' using inquiry-based learning is an importantly alternative solvency in executing essential assignments in understanding a particular material. In this case, teacher, an identified user, is investigated by connecting to the used system on whether the system is obligatory for teacher himself and students or merely a complementary in learning process. Teacher need a medium to deliver materials through 'Molearn'. Meanwhile, in students' point of view as the users, the needs of social interaction which is built within the utilization of 'Molearn' application can be portrayed by the existence of forum menu to discuss any problems between students and teacher or among students themselves. Utilizing frequency is important to notify as materials to evaluate in conducting learning in classroom activities. Henceforth, it needs a calculation of total access had by each student and menu type used by students. It is expected that mobile learning 'Molearn' can be used as ways of students' autonomous learning style.

Psychological characteristic is looking at several aspects such as cognitive style, attitude, motivation, patience, and expectations. Cognitive style considers the users' skill in absorbing either spoken, special, analytical, intuitive, concrete, or abstract information. It is important to give attention to

users' attitude identification in completing certain assignments by utilizing 'Molearn', also to identify motivation beyond the users' decision in using such e-learning mobile learning. The last stage is to identify users' perspectives in patience and expectation aspects, a complete set of menu which becomes expected existing in 'Molearn'. Another important aspect is psychological physic by knowing users' ages and special physical utilization skills. The four aspects mentioned above must be the core of attention in identifying the users and their needs.

Process Design

A. Conceptual Model

There are several processes in preparation stage namely defining activities by arranging basic analysis prerequisite from 'Molearn' functions, identifying assignments which can be done recently, constructing and developing conceptual model.

The next stage is to determine objectives. This study aims at investigating the needs of learning concept and model relevantly to inquiry-based method, which later becomes basic rational in developing web-based learning or mobile learning 'Molearn' for senior high students especially for Biology subject. Meanwhile, the long term objective in utilizing 'Molearn' is to contribute in the improvement of senior high students' learning achievement and indirectly to positively habituate the use of information technology through leaning activities.

The next stage is to determine inquiry-based method in utilizing process of 'Molearn'. By observing on the characteristics and specification of inquiry method, Biology subject in Science Major at Senior High School becomes the pilot project in this study.

Utilizing 'Molearn' stage done by teacher is by creating virtual class, constructing materials for Biology class, preparing reliable sources such as materials, assignments, assessment, discussion forum and medium that will be used in teaching and learning process. The next stage is the preparation of utilizing 'Molearn' and the final stage is evaluation. Figure 2 shows all above stages in sequence.

Support 'Molearn' in the learning process includes place, content, communication, feedback and assignment:

- Place: learning anywhere, anytime
- Content: text, image, voice, graphics, animation, video based instructions
- Communication: teacher to student/ student to student : instant communication, spontaneous, instant delivery of notification, e-mail or sms and synchronous, flexible, audio/ video conference
- Feedback from teacher: less printing, less paper, lower cost and performance/ improvement-based grading, instant feedback possible
- Assignments: any time and any place possible, individualized tests, flexible-length/number of questions, practical oriented assignments direct on site, simultaneous collaborative group work possible

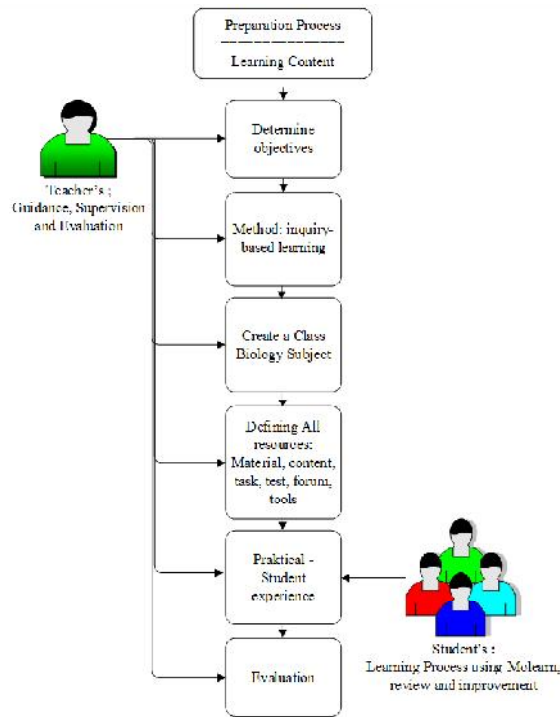


Fig. 2 The preparation of utilizing 'Molearn'.

B. Standardized Design

It is important to look at standardized design, a standard value for appropriate design, based on either user or developer point of view. Moreover, identifying training needs and determining standardized documentation are either important. Standard value based on user point of view focuses on the acceleration of operation including but not limited to minimizing errors, minimizing time process in comprehending materials, utilizing proper system, enhancing user's satisfactory, improving the acceptance of innovative system, and cutting budgets. In other sides, a standard value based on developer point of view includes improving the visibility of human-computer interaction, simplifying design, minimizing operational times, minimizing over efforts, providing guidelines for quality control supervision, and documenting system.

Conclusion

Based on above explanation related to mobile learning 'Molearn', it can be retracted that inquiry-based learning can support the development of four aspects namely teacher, students, resources, and medium. For teacher, 'Molearn' can help teacher to dominantly act as guider, supervisor and assessor. Teacher needs a technical training in relation with education technology and information technology. In other perspective, 'Molearn' needs the students' awareness in being independent learners along the learning activities. It is important to notify that students may need adaptation times in the first time of implementation 'Molearn'. Henceforth, they need helps

and guides in overcoming learning difficulties, improving self-confidence and maintaining learning motivation by utilizing 'Molearn'. A proper learning strategy must be set in case of developing scientific thinking skills and students' collaborative learning through 'Molearn'. Students need to be taught about improving self-management, self-monitoring, and autonomy skill while learning and understanding their own cognitive characteristics. As resources supports, 'Molearn' needs diverse internet-based materials sources and non-internet-based ones such as books, tools, and soon. Easy access, appropriateness, and effectiveness in teaching also needs to pay attention. The last one is that 'Molearn' needs various tool and communicative medium supports, as well as the systematic procedures in utilizing information and knowledge. Knowledge and communication transfer between teacher and students must be conducted as interesting as possible, and create possibility of two ways communication between teacher and students.

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